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TOWARDS THE DEVELOPMENT OF A NEW ROLLING ROVER ACTUATED BY MEANS OF ELECTROACTIVE POLYMERS

Abstract

Electroactive polymers (EAP) can be favourably used for the construction of smart structures and in innovative robotic applications. In particular, EAP can be used for the construction of rolling rovers for space exploration, which are moved by exploiting the deformation of their EAP surface. The advantages of EAP based rolling rovers with respect to classical rovers are several: small mass requirements, small volume requirements, since they can be folded during launch and then deployed during the mission, and increased locomotion performance. In this paper a study of the optimal shape and configuration of the rover is carried out, by comparing different concepts taking into account their locomotion performance, the feasibility of a balanced prototype from a production point of view, and eventual problems in the folding and deployment operations. In particular, rovers with and without a foldable rigid internal frame are considered, and different frame concepts are analyzed and compared in the first case. The locomotion of the system is obtained by controlling the center of mass of the rover and the contact point with the ground, using EAP actuators which deform the rover surface. Finally, an experimental prototype is developed and tested in order to validate the feasibility of the selected configuration both from an operative and a production point of view.